LOGISTICS ANALYSIS: A KEY TO LIFE-CYCLE MANAGEMENT

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Introduction

As the Army enters the 21st century, life-cycle management becomes increasingly valuable in guiding the materiel acquisition process. In a memorandum signed by the Army Acquisition Executive (AAE) on March 20, 2000, senior Army leaders were reminded that, "The focus of life cycle management is to develop, field and sustain high quality warfighting systems at the lowest total cost." Many factors contribute to this daunting task, particularly because most of the decisions involve multiple variables simultaneously.

Fortunately, the logistics analysis community has many tools and techniques that help acquisition managers address the task of lowering total cost. By using the tools described below early in the development cycle, acquisition managers can decide—based on the impact on total cost—whether a system component should be repaired or replaced and whether organic or contractor support should be employed for maintenance or supply.

Acquisition managers can field systems with spares packages that achieve a required readiness rate at the lowest possible cost. They can identify the true cost drivers of fielded systems to determine which ones provide the highest expected total cost reduction if they are reduced or eliminated. The tools and techniques to address the AAE's goals are not new; most have been available for years. However, they need to be applied, and the following four situations are examples of where these logistical tools can be used.

Situation No. 1

A system with 175 line replaceable units (LRUs) and 400 shop replaceable units (SRUs) is being developed. A total of 900 end items that will operate 2,000 hours per year and have a reliability of 1,200 hours mean-time-between-failure will be fielded. To respond to the AAE's goals, which LRUs and SRUs should be repaired and which should be discarded upon failure? Which should be repaired by the contractor? These issues have significant impact on total cost.

A decision to minimize total cost must be made, but that decision depends on the cost of each LRU and SRU. In addition, managers must consider the cost of developing, procuring, and maintaining test equipment for any LRU or SRU that will be repaired. Other cost-related factors include the time required to return a failed component to the repair site as well as the time necessary to make the repair.

The task of minimizing total cost can be impossible unless a model such as the Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS) is used. This model can provide the maintenance concept that minimizes total cost by considering in combination the cost of the LRUs/SRUs, the number of maintainers and their location, the spares required at each location, the customer wait time, the cost of test equipment, the cost of alternative repair options such as contractor repair, and many other factors. This model also allows for conducting sensitivities in these areas, providing more insight to the developer. Gathering good data to run this model can be a time-consuming effort, but the result can meet the AAE's goals and create significant cost savings.

Situation No. 2

The same system will be fielded using the maintenance concept developed from COMPASS. Assuming a 90-percent Operational Availability (Ao) goal for the system, which LRUs and SRUs should be stocked to minimize total cost? How many of each should be stocked? Managers must consider how often LRUs or SRUs will fail and how long it will take to repair and return them to stock.

Other options include direct vendor delivery or premium service delivery of repaired components. One factor that may have an impact here involves the good components that are removed and sent on for unnecessary repair, usually referred to as the No-Evidence-of-Failure (NEOF) rate. But the Selected Essential-Item Stock for Availability Method (SESAME) model can be used to identify the mix of spares that provide the required readiness at the least total cost. This model considers these and other factors in combination to minimize the total cost. SESAME is also useful in identifying the incremental cost of achieving a particular Ao goal.

A graph of cost versus Ao was generated for an Army program as provisioning was being determined, using SESAME. That graph showed that the cost of achieving a 93-percent Ao was less than $50,000, whereas the cost of achieving the required 97-percent Ao escalated to more than $200,000. That was an excellent example of where cost as an independent variable (CAIV) analysis could be conducted by both the combat and materiel developers to determine how much, in an effort to balance minimizing total cost with the performance required by the warfighter, a 4-point increase in Ao is worth to the Army.

Is SESAME being used by acquisition managers to help minimize total cost? Although SESAME is required by AR 700-18, *Provisioning of U.S. Army Equipment*, to be used for initial provisioning, a 1998 Army Audit Agency Report showed only 7 of the 35 systems studied used SESAME to compute the initial spares packages. The project managers for the remaining 28 systems may have expended more funds than necessary to provision their systems.

Situation No. 3

Several LRUs of a fielded system have high NEOF rates. Which LRUs should be targeted for reduction **or** elimination of that rate? Should the most expensive LRU or the one with the highest rate be targeted? In addition to cost and frequency, the following factors should be considered: the number of fielded systems and their yearly usage, the customer wait time, transportation costs, remaining years of useful life, the cost of developing and maintaining a screening capability, and the number of maintenance locations where screening can take place.

These data are available in various Army databases. Only when factors are accounted for in combination can acquisition managers decide which LRU is the best candidate for NEOF rate reduction or elimination. The candidate may be the one with the lower rate or one with the lowest unit cost. A spreadsheet analysis can help focus the decision on the correct LRU. This analysis identifies the costs of eliminating the NEOF and the savings achieved. A wrong decision can actually result in a higher total cost.

Situation No. 4

For developmental systems that replace fielded systems, acquisition managers must focus on those components that drive total cost for the replaced system. This evaluation cannot be performed by merely identifying the components with the highest replacement costs and then eliminating or improving those components. All factors driving operations and support component costs must be evaluated, including associated costs to repair, store, and ship. For fielded systems, this type of analysis can provide significant opportunities for reducing total costs.

Acquisition managers can use a variety of Army databases to get a history of supply and maintenance activities for all the components of the fielded system. The components can be separated according to whether they are unique or common, and reparable or consumable. Data on credits given to the field for both serviceable and unserviceable returns can be factored into the component's total cost. This information can then be used to generate an initial list of ranked cost drivers.

For each component on the list, an assessment can be made as to how reliability can be improved, the cost of that improvement, and the savings from reductions in maintenance, spares, supply pipeline, and other costs. Acquisition managers can then determine the net cost savings for a reliability improvement, rerank the original list according to this net savings, and optimize the total cost reduction program.

Logistics analysis can also reduce total cost by helping to determine whether components already in "long supply" are being repaired or whether consumable components are being repaired instead of being discarded. Logistical analysis can also be used to determine whether components are being repaired for a higher cost than if they were simply requisitioned.

Conclusion

These four examples show that logistical analysis can help acquisition managers reduce total costs. In some cases, the analysis requires models such as COMPASS or SESAME. In other cases, spreadsheet analyses and data obtained from various Army databases can help acquisition managers identify courses of action to efficiently reduce total cost.

Logistics analysis is a crucial capability that all acquisition managers must take advantage of to meet the AAE's stated goals. The good news is that tools and techniques are available now.

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